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(54) **Hot runner manifold bushing**

Buchse für Heisskanalverteiler

Douille pour distributeur à canaux chauds

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(73) Proprietor:
HUSKY INJECTION MOLDING SYSTEMS LTD.
Bolton Ontario L7E 5S5 (CA)

(72) Inventor: **Gessner, Dieter**
D-6367 Karben (DE)

(74) Representative:
Weiss, Peter, Dr. rer. nat.
Dr. Weiss, Weiss & Brecht
Zeppelinstrasse 4
78234 Engen (DE)

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EP 0 590 678 B1

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Description

BACKGROUND OF THE INVENTION

The present invention relates t an apparatus for injecting molten plastic material int a molding machine according to the first part of claim 1 and in particular, to an improved bushing arrangement to be incorporated into the injection apparatus.

Figure 1 illustrates a manifold bushing construction 30 for an injection molding apparatus having a conventional thermal expansion sealing nozzle 32. This type of injection molding apparatus and manifold bushing construction is illustrated in detail in US-A-4,173,448.

Subsequent to the development of the thermal expansion sealing nozzle, the spring sealing nozzle was developed. Figure 2 illustrates a molding system with such a spring sealing nozzle. The substitution of the spring sealing nozzle for the thermal expansion sealing nozzle brought one major problem along with it - namely, a leakage problem. The cause of this problem can be traced to the fact that it is very difficult to manufacture manifold bushing spigots with a length that exactly matches the depth of the corresponding recess in the manifold. Consequently a very small gap may exist at the interfaces 10 and 12. Furthermore, the diameter of the spigot 14 has to be slightly smaller than th bore in between the interfaces 10 and 12. When this happens, the plastic, which is subjected to injection pressure, exerts a large separating force at the interfaces 10 and 12 by virtue of the comparatively large projected areas on which it can act. This separating force can overcome the spring force trying to maintain the seal at the interface and leakage can occur.

Other prior art arrangements of manifold bushing and nozzle assemblies face still other problems. For example, US-A-5,022,846 shows a nozzle and a manifold bushing screwed together through the manifold with bolts. This construction means that when the manifold thermally expands laterally, the nozzle must travel laterally as well or deflect, thereby causing premature wear and the possibility of leakage.

US-A-4,043,726 shows a construction having a spring loaded nozzle assembly with an adjustable set screw. The valve stem and the valve action are within the nozzle body. Injection pressure opens the valve and spring pressure closes it. Lateral thermal expansion takes place along the connecting pipe as it slides inside the nozzle body. The disadvantage of this method is that a double acting air operated valve stem is difficult to incorporate in this design. The publication "The Heat-Lock distribution system" by Nil Helldin AB of Sweden illustrates a similar system.

Finally, it is known in the art that it is often necessary to block hot runner channels in a manifold. This is because the manifold 20 has several drilled channels, the ends of which have to be plugged in order t obtain a desired flow path. Figur 3 illustrates a plugging system used in connection with one such manifold to ensure a safe, leak free manifold. In this system, the end f a hole 22 in the manifold is tapered and threaded. Then a tapered plug 24 is fitted and inserted and held in place with a threaded set screw 26. Th insid f the plug 24 is machined in place to match the contour of the channel. On a multicavity manifold, this procedure is both time consuming and expensive. In order to clean out the channels, each plug has to be removed and new ones installed and machined in place.

US-A-3,849,048 shows a hydraulically actuated piston housing that takes up the cold clearance to prevent leakage. This piston acts like a spring. Inside the housing is a second hydraulic piston which drives the valve stem. The nozzle body is threaded into the manifold insert and therefore thermally expands laterally when the manifold expands. The close proximity of flammable hydraulic oil to the heated manifold means that there is a great risk of fire with this design after the seals have worn.

US-A-3,252,184 shows a manifold bushing piece inserted through the manifold and butted against the spigotted end of the nozzle body. Because the nozzle body is spigotted to the manifold, it must travel laterally when the manifold thermally expands.

US-A-3,023,458 illustrates a one piece manifold bushing and nozzle body inserted through the manifold. The valve stem is closed with a spring and opened via injection pressure. The nozzle end of the bushing appears to be located in a recess in the mold cavity plate and clearly cannot accommodate lateral thermal expansion of the manifold plate with respect to the cavity plate. In effect, bending occurs which would tend to cause the valve stem to bind.

US-A-3,716,318 on which the preamble of claim 1 is based shows a combined nozzle/manifold bushing piece which is inserted through the manifold from the underside and is retained by a threaded piston housing. This construction is also disadvantageous in that the nozzle assembly must travel laterally with the manifold as it thermally expands.

Accordingly, it is an object of the present invention to provide an improved apparatus for injecting plastic material wherein the possibility of having leakages of the plastic material is significantly reduced.

It is a further object of the present invention to provide an apparatus as above wherein lateral expansion of a manifold is not transmitted to a nozzle assembly through which said plastic material flows.

It is still a further object of the present invention to provide an apparatus as above wherein the need to plug holes in a manifold is performed in a simpler and less expensive fashion.

It is yet a further object of the present invention to provide an improved bushing arrangement which has utility in valve gated applications and in non-valve gated applications.

Still other objects and advantages of the pr sent

inventi n will become more apparent from the following description and drawings in which like ref rence numerals depict like elements.

SUMMARY OF THE INVENTION

The foregoing objects and advantages are attained by the plastic material injection apparatus according to claim 1. The plastic material injection apparatus of the present invention includes a housing, a manifold bushing for locating the housing, and means for mechanically joining the manifold bushing to the housing so as to minimize the possibility of plastic material leakage between the manifold bushing and the housing. The mechanical joining means comprises a threaded portion on the manifold bushing and a mating nut arrangement for joining the housing to the manifold bushing.

The apparatus can further include a manifold through which plastic material flows. The manifold bushing has a mating channel for transmitting the plastic material from the manifold to an axial channel in a nozzle body. At least one dowel is provided to adjust the location of the manifold bushing so that a first melt channel in the manifold is aligned with the mating melt channel in the manifold bushing. In addition to the melt channel, the manifold bushing has a first portion which contacts the underside of the manifold, a second portion which is dimensioned to fit within a bore in the manifold and to be substantially coextensive with said bore, and a third portion which includes said threaded portion. It has been found that one advantage to the manifold bushing arrangement of the presently discussed embodiment is that it also serves to plug any other channels or bores within the manifold.

Still further, the apparatus of the present invention can include a nozzle body which is independent of the manifold so that lateral expansion of the manifold is not transmitted to the nozzle body. The nozzle body may or may not include a valve gate arrangement.

Still other embodiments of the present invention are set forth in the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a prior art bushing construction for an injection molding apparatus;

Figure 2 illustrates a prior art injection molding apparatus having a spring sealing nozzle;

Figure 3 illustrates a prior art plugging system;

Figure 4 illustrates a plastic material injection apparatus having the improved bushing arrangement of the present invention;

Figure 5 illustrates the bushing arrangement of Figure 4 blocking a through hole in a manifold in which it is housed; and

Figure 6 illustrates the bushing arrangement of the pr sent invention in a non-valv gated injection apparatus.

DETAILED DESCRIPTION

Referring now to Figure 4, a hot runner valve gate system for injecting plastic material into a mold or the like is illustrated. The system includes a manifold backing plate 102, a manifold plat 104, and a mold plate 106. The system further includes a nozzle assembly 108 for introducing molten plastic material into a mold (not shown) and a manifold/bushing arrangement 110 for allowing communication of plastic material from a source (not shown) to the nozzle assembly.

As shown in Figure 4, the nozzle assembly 108 consists of a nozzle body 112, a tip 114, a heater 116 and springs 118. The purpose of the springs 118 will be discussed hereinafter. The nozzle body 112 is typically made of steel, while the tip 114 may be formed from any suitable highly heat-conductive material known in the art such as beryllium/copper. The nozzle body has an axial channel 120 through which molten plastic material flows. The tip 114 surrounds a terminal part of the axial channel 120. If desired, the nozzle tip may include a sheath 122 for thermally insulating the downstream end of the nozzle tip from the relatively cold mold plate 106. The sheath 122 may be formed from a resinous material which may be prefabricated. Alternatively, the sheath 122 may be formed from an overflow of injected resin in the first operating cycle or cycles.

The heater 116 may be any suitable electric heater known in the art to which current is admitted by way of a cable 124. As shown in Figure 4, the heater surrounds a portion of the nozzle body.

A valve stem 126 is provided to permit opening and closing of the gate 128 in the nozzle body. The valve stem may be formed by a steel rod which extends through a passageway 129 in the bushing 130 and into the nozzle body 112. As can be seen from Figure 4, the passageway 129 mates with a melt channel 144 in the bushing 130. The end of the valve stem opposite to the gate 128 is connected to a piston head 131 by a screw and clamp arrangement 132.

The piston head 131 is housed within a cylinder chamber formed by end walls 133 and 134 of an air piston housing 136 and the plate 102. Downstroke of the piston causes the valve stem to move into a position whereat it closes or reduces the cross sectional area of the gate 128 so as to restrict flow of the molten plastic material. Upstroke of the piston causes the valve stem to move so as to increase flow of the molten plastic material through the gate 128.

As previously discussed, the valve gate system of the present invention also includes a manifold/bushing arrangement consisting of the manifold 138 and the bushing 130. The manifold 138 is formed by a distribution plate housed between the plates 102 and 104 but separated therefrom by an air gap 140. The manifold includes a melt channel 142 forming part of the hot runner system for transporting molten plastic mat rial from a source (n t shown) t the gate 128 associated with a

respective mold or molds. The manifold further includes a bore 143 into which th bushing 130 is inserted. The manifold may be formed from any suitable metal or heat conducting material known in the art.

Th bushing 130 is known as a manifold bushing. It surrounds a portion of the valve stem 126. The manifold bushing is formed from any suitable material known in the art (usually steel) and is designed to be inserted through the manifold 138 from the underside. As shown in Figure 4, the melt channel 144 in the bushing mates with the channel 142 in the manifold and the axial channel 120 in the nozzle assembly. One or more dowels 146 are provided to facilitate alignment of the manifold 138 and the bushing 130 so that the channels 142 and 144 are in alignment with each other.

The bushing 130 has a first or lower portion 148 which is located between the underside of the manifold 138 and an upper surface 150 of the nozzle body. The bushing further has a second or central portion 152 which has an outside diameter substantially equal to the diameter of the bore 143 in the manifold 138. Still further, the bushing has a third or upper portion 154 which is threaded along at least part of its extent.

As shown in Figure 4, the third portion 154 of the bushing extends through an aperture 156 in the air piston housing. A nut 158 is provided to mechanically join the bushing 130 to the air piston housing 136. If desired, ne or more washers and/or locking washers 160 may be inserted between a surface of the nut 158 and a surface of the air piston housing 136 to insure a good mechanical connection between the air piston housing and the bushing. By holding the valve bushing 130 and the air piston housing tightly with the nut 158, there is no possibility of leakage. A steel O-ring 159 is provided to further reduce the possibility of leakage of the plastic material up the sidewall 143.

The springs 118 deflect as the nozzle body 112 and the air piston housing 136 expand due to increases in temperature. In accordance with the present invention, the springs 118 cause a spring action in the nozzle assembly. It should be noted however that any action caused by the springs 118 on the nozzle body 112 is completely independent of any sealing action between the manifold bushing 130 and the manifold 138 and between the manifold bushing 130 and the air piston housing 136.

It has been found that this arrangement of parts is quite advantageous. For example, the manifold bushing 130, the air piston assembly and the valve stem 126 are located and held firmly by the manifold 138. Still further, this arrangement helps reduce the possibility of plastic material leakage between the manifold bushing 130 and the air piston housing 136 and between surfaces of the bushing 130 and the manifold 138. This approach also eliminates the need for a cold clearance and overcomes the need for very closely toleranced components in order to avoid plastic leakage.

Anoth r principal advantage of the system f th present invention is the avoidance of lateral travel or expansion of th nozzle body 112 due to lateral expansion of the manifold 138. Lateral expansion of the manifold occurs due to thermal contact with the molten plastic material and due to heat from th heater(s) 116. In th system of the present invention, this lateral expansion will be transmitted to the manifold bushing 130 but not to the nozzle body 112. Instead, the nozzle body and the nozzle assembly will remain substantially or entirely stationary as the manifold 138 and the bushing 130 slide relative to and across the upper surface 150 of the nozzle body.

Figure 5 illustrates yet another advantage to the design of the present invention. Manifolds typically have more than one hot runner channel 162. The ends of those channels not in use must be plugged in order to obtain a desired flow path. In the past, expensive plugging systems were used to insure a safe, leak free manifold having the desired flow path. As can be seen from Figure 5, the bushing 130 of the present invention eliminates the need for such plugging systems. Since the bushing 130 extends virtually the entire width of the manifold and has a channel which mates with a desired melt channel for establishing a desired flow path in the manifold, there is no need to plug any other channel or channels 162 within the manifold.

While the bushing arrangement of the present invention has been discussed in the context of a valve gated hot runner system, Figure 6 illustrates how substantially the same bushing can be incorporated into a non-valve gated system. This type of system is identical to the one shown in Figure 4 with the principal exception that the bushing 130' lacks a passageway for a valve stem. Thus, it is possible that a valve gated manifold can be converted to a non-valve gated one without any modification to the manifold itself. As a result of this, manifolds can be standardized regardless of gate type and can be made faster and cheaper since plugging of the holes is no longer required. Additionally, cleaning out the channels in the manifold is also more convenient since no machining in place of new plugs is required.

Claims

1. An apparatus for injecting plastic material, said apparatus comprising:

   an housing (136);

   a bushing (130, 130') for locating said housing (136); and

   means for mechanically joining (158) said bushing (130, 130') to said housing (136) so as to reduce the possibility of leakage of said plastic material between said bushing (130, 130') and said housing (136);

said housing (136) having an aperture (156) **characterized in that**

said bushing (130, 130') having an upper portion (154) which extends through said aperture (156); and

said mechanical joining means comprising a threaded portion on the upper portion (154) of the bushing (130, 130') and a nut (158) for engaging said threaded portion, the nut (158) resting on top of said housing (136).

2. The apparatus of claim 1 wherein said mechanical joining means further comprises:

a washer (160) positioned intermediate a surface of said nut (158) and a surface of said housing (136); and

said washer (160) surrounding a part of said threaded portion.

3. The apparatus of one of claims 1 or 2 further comprising:

a manifold (138) having a first channel (142) through which said plastic material flows; and

said bushing (130, 130') having a second channel (144) which mates with said first channel (142) and being inserted into said manifold (138) from an underside thereof.

4. The apparatus of claim 3 further comprising:

dowel means (146) for adjusting the location of said manifold (138) so that said first channel (142) is aligned with said second channel (144).

5. The apparatus of claim 4 further comprising:

said manifold (138) having a bore (143) for receiving said bushing (130, 130');

said manifold bore (143) having a first diameter;

said bushing (130, 130') having a first portion (148) contacting said underside of said manifold (138), said first portion (148) having a second diameter greater than said first diameter;

said bushing (130, 130') having a second portion (152) substantially coextensive with said manifold bore (143), said second portion (152) having an out r diameter substantially equal t said first diameter so as to prevent leakage of plastic material between surfaces of said bushing (130, 130') and said manifold (138) and serving to plug any channels (162) in said manifold (138) other than said first channel (142); and

said bushing (130, 130') having a third portion (154), said third portion (154) including a threaded portion which forms part of said mechanical joining means.

6. The apparatus of one of claims 4 or 5 further comprising:

a nozzle assembly (108) through which said plastic material flows, said nozzle assembly (108) including a nozzle body (112) with a tip portion (114), heater means (116) for keeping said plastic material molten, spring means (118) which deflect as said nozzle body (112) and said housing (136) expand due to temperature increases, said spring means (118) causing a spring action in said nozzle assembly (108), and said spring action being independent of any sealing action between said bushing (130, 130') and said manifold (138) and between said bushing (130, 130') and said housing (136).

7. The apparatus of claim 6 further comprising:

said manifold (138) being subject to lateral Expansion which causes said manifold (138) to slide relative to a surface of said nozzle assembly (108);

said bushing (130, 130') travelling with said manifold (138) as said manifold (138) expands due to said bushing (130, 130') being positioned within said manifold (138) and said nozzle assembly (108) remaining substantially stationary when said manifold (138) slides relative to said nozzle assembly surface.

8. The apparatus of claim 6 or 7 further comprising:

said nozzle assembly (108) having an axial channel (120) through which said plastic material flows;

a valve stem (126) for opening and closing said axial channel (120); and

said valve stem (126) extending through said second channel (144) in said bushing (130), and a passageway (129) in said bushing (130) which mates with said second melt channel (144) in said bushing (130) and the end of the

valve stem (126) opposite t the gate (128) is connected t a piston head (131) so that the housing is an air piston housing (136).

9. The apparatus of at least one of claims 1 - 8 comprising:

a manifold (138) having al melt channel (142) in communication with a source of plastic material;

a bushing (130) having a melt channel (144) for mating with said melt channel (142) in said manifold (138), said bushing (130, 130') being positioned within a bore (143) in said manifold (138);

a nozzle assembly (108) for injecting plastic material into said mold, said nozzle assembly (108) having an axial channel (120) in communication with said melt channel (144) in said bushing (130, 130');

said manifold (138) being subject to lateral expansion which causes said manifold (138) to slide relative to a surface of said nozzle assembly (108);

said bushing (130, 130') travelling with said manifold (138) as said manifold (138) expands; and

said nozzle assembly (108) remaining substantially stationary once said manifold slides relative to said nozzle assembly surface.

Patentansprüche

1. Kunststoffspritzgiessvorrichtung mit:

einem Gehäuse (136);

einer Buchse (130, 130'), um das Gehäuse (136) zu halten; und

Elementen für die mechanische Verbindung (158) der Buchse (130, 130') mit dem Gehäuse (136), um die Möglichkeit des Auslaufens des Kunststoffes zwischen der Buchse (130, 130') und dem Gehäuse (136) zu verringern;

wobei das Gehäuse (136) eine Öffnung (156) aufweist,
dadurch gekennzeichnet,

dass die Buchse (130, 130') ein oberes Teilstück (154) aufweist, w lches sich durch die Öffnung (156) rstr ckt; und

die mechanischen Verbindungselemente einen Gewindeabschnitt auf dem oberen Teilstück (154) der Buchs (130, 130') und ein Mutter (158) für die Befestigung dieses Teilstücks aufweisen, wobei die Mutter (158) oben auf dem Gehäuse (136) aufsitzt.

2. Vorrichtung nach Anspruch 1, wobei die mechanischen Verbindungselemente aus folgendem bestehen:

einer Unterlegscheibe (160), welche zwischen einer Oberfläche der Mutter (158) und einer Oberfläche des Gehäuses (136) angeordnet ist; wobei
diese Unterlegscheibe (160) einen Teil des Gewindeabschnitts umgibt.

3. Vorrichtung nach Anspruch 1 oder 2, gekennzeichnet ferner durch

einen Verteiler (138), welcher einen ersten Kanal (142), durch den der Kunststoff fliesst, aufweist; wobei

die Buchse (130, 130') einen zweiten Kanal (144) aufweist, welcher sich mit dem ersten Kanal (142) vereint, und von einer Unterseite in den Verteiler (138) eingesetzt ist.

4. Vorrichtung nach Anspruch 3, gekennzeichnet weiter durch

Stiftelementen (146) für die Einstellung der Position des Verteilers (138), so daß der erste Kanal (142) auf den zweiten Kanal (144) ausgerichtet ist.

5. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, dass

der Verteiler (138) eine Bohrung (143) für die Aufnahme der Buchse (130, 130') aufweist;

die Verteilerbohrung (143) einen ersten Durchmesser aufweist;

die Buchse (130, 130') einen ersten Abschnitt (148) aufweist, der mit der Unterseite des Verteiler (138) in Kontakt steht, wobei der erste Abschnitt (148) einen zweiten Durchmesser aufweist, welcher grösser als der erste Durchmesser ist,

die Buchse (130, 130') einen zweiten Abschnitt (152) aufweist, welcher sich im wesentlichen entlang der Verteilerbohrung (143) erstreckt, wobei der zweite Abschnitt (152) inen äusse-

r n Durchmesser aufweist, welcher im wesentlichen dem ersten Durchmesser entspricht, so dass ein Auslaufen des Kunststoffes zwischen den Oberflächen von Buchse (130, 130') und Verteiler (138) vermieden wird, und dazu dient, andere Kanäle (162) als den ersten Kanal (142) in diesem Verteiler (138) zu verstopfen; und

die Buchse (130, 130') einen dritten Abschnitt (154) mit einem Gewindeabschnitt aufweist, welcher einen Teil des mechanischen Verbindungselementes bildet.

6. Vorrichtung nach einem der Ansprüche 4 oder 5, gekennzeichnet durch

eine Düseneinheit (108), durch die der Kunststoff fliesst, wobei die Düseneinheit (100) einen Düsenkörper (112) mit einer Spitze (114), Heizelemente (116), um den Kunststoff geschmolzen zu halten, Federelemente (118), welche bei der Ausdehnung des Düsenkörpers (112) und des Gehäuses (136) durch Temperaturanstieg nachgeben, aufweist, wobei die Federelemente (118) eine Federaktion in der Düseneinheit (108) bewirken und diese Federaktion unabhängig von jeder Dichtungsaktion zwischen der Buchse (130, 130') und dem Verteiler (138) und zwischen der Buchse (130, 130') und dem Gehäuse (136) ist.

7. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, dass

der Verteiler (138) einer seitlichen Ausdehnung unterworfen ist, was bewirkt, dass der Verteiler (138) relativ zu einer Oberfläche der Düseneinheit (100) gleitet;

die Buchse (130, 130') sich mit dem Verteiler (138) zusammen bewegt, wenn der Verteiler (138) sich aufgrund der Buchse (130, 130'), welche in dem Verteiler (138) angeordnet ist, ausdehnt und

die Düseneinheit (108) im wesentlichen feststehend bleibt, wenn der Verteiler (138) relativ zu der Düseneinheitsoberfläche gleitet.

8. Vorrichtung nach Anspruch 6 oder 7, dadurch gekennzeichnet, dass

die Düseneinheit (108) einen axialen Kanal (120), durch welchen der Kunststoff fliesst, aufweist;

ein Ventilschaft (126) für das Öffnen und Schliessen des axialen Kanals (120) vorgesehen ist; und

d r Ventilschaft (126) sich durch den zw iten Kanal (144) in der Buchse (130) und einen Durchgang (129) erstreckt, welcher sich mit dem zweiten Schmelzekanal (144) in der Buchse (130) verbindet, wobei das Ende des Ventilschaftes (126), welches dem Anguss gegenüberliegt, mit einem Kolben (131) verbunden ist, so dass das Gehäuse ein Luftkolbengehäuse (136) ist.

9. Vorrichtung nach wenigstens einem der Ansprüche 1 bis 8, gekennzeichnet durch

einen Verteiler (130) mit einem Schmelzekanal, welcher mit einer Kunststoffquelle in Verbindung steht;

eine Buchse (130) mit einem Schmelzekanal (144), welcher sich mit dem Schmelzekanal (142) in dem Verteiler (138) verbindet, wobei die Buchse (130, 130') in einer Bohrung (143) in dem Verteiler (138) angeordnet ist;

einer Düseneinheit (108), um Kunststoff in die Form zu spritzen, wobei die Düseneinheit (108) einen axialen Kanal (120) aufweist, welcher in Verbindung mit dem Schmelzekanal (144) in der Buchse (130, 130') steht; wobei

der Verteiler (138) einer seitlichen Ausdehnung unterworfen ist, die bewirkt, dass der Verteiler (138) relativ zu einer Oberfläche der Düseneinheit (108) gleitet;

die Buchse (130, 130') sich zusammen mit dem Verteiler (138) bewegt, wenn der Verteiler (138) sich ausdehnt; und

die Düseneinheit (108) im wesentlichen stationär verbleibt, wenn der Verteiler relativ zu der Oberfläche der Düseneinheit gleitet.

Revendications

1. Appareil d'injection de matière plastique, cet appareil comprenant :

- un boîtier (136) ;
- une douille (130, 130') pour positionner le boîtier (136) ; et
- un moyen de jonction mécanique (158) de la douille (130, 130') au boîtier (136) de manière à réduire les risques de fuite de la matière plastique entre la douille (130, 130') et le boîtier (136) ;

- le boîtier (136) étant percé d'une ouverture (156),
caractérisé en ce que
- la douill (130, 130') comporte une partie supérieure (154) qui passe à travers l'ouvertur (156) ; et
- le moyen de jonction mécanique comprend une partie filetée sur la portion supérieure (154) de la douille (130, 130') et un écrou (158) destiné à venir se visser sur la partie filetée, l'écrou (158) venant s'appuyer sur le dessus du boîtier (136).

2. Appareil selon la revendication 1,
dans lequel
le moyen de jonction mécanique comprend en outre :

- une rondelle (160) placée dans une position intermédiaire entre une surface de l'écrou (158) et une surface du boîtier (136) ; et
- la rondelle (160) entoure une portion de la partie filetée.

3. Appareil selon l'une des revendications 1 ou 2, comprenant en outre :

- un distributeur (138) comportant un premier canal (142) à travers lequel s'écoule la matière plastique ; et
- la douille (130, 130') comportant un second canal (144) qui s'adapte au premier canal (142) et s'introduit dans le distributeur (138) par son côté inférieur.

4. Appareil selon la revendication 3,
comprenant en outre :
un moyen de goujon (146) pour régler la position du distributeur (138) de façon que le premier canal (142) soit aligné avec le second canal (144).

5. Appareil selon la revendication 4,
comprenant en outre :

- la tubulure (138) comportant un alésage (143) destiné à recevoir la douille (130, 130') ;
- l'alésage (143) du distributeur présentant un premier diamètre ;
- la douille (130, 130') comportant une première partie (148) venant en contact avec le côté inférieur du distributeur (138), cette première partie (148) présentant un second diamètre supérieur au premier diamètre ;
- la douille (130, 130') comportant une seconde partie (152) coopérant essentiellement avec l'alésage (143) du distributeur, cette seconde partie (152) présentant un diamètre extérieur exactement égal au premier diamètre de manière à éviter toute fuite de matière plastique entr les surfaces de la douille (130, 130') et du distributeur (138), cette seconde partie (152) servant à boucher t us canaux (162) du distributeur (138) autr s que le premier canal (142) ; et
- la douille (130, 130') comportant un troisième partie (154), cette troisième partie (154) comprenant une portion filetée qui fait partie du moyen de jonction mécanique.

6. Appareil selon l'une des revendications 4 ou 5, comprenant en outre :
un dispositif de buse d'injection (108) à travers lequel s'écoule la matière plastique, ce dispositif de buse (108) comprenant un corps de buse (112) avec une partie de bout (114), un moyen de chauffage (116) pour maintenir la matière plastique en fusion, un moyen de ressort (118) qui dévie lorsque le corps de buse (112) et le boîtier (136) se dilatent du fait d'augmentations de température, le moyen de ressort (118) produisant une action de ressort dans le dispositif de buse (108), et cette action de ressort étant indépendante de toute action d'étanchéité entre la douille (130, 130') et le distributeur (138), ainsi qu'entre la douille (130, 130') et le boîtier (136).

7. Appareil selon la revendication 6,
comprenant en outre :

- le distributeur (138) étant soumis à une dilatation latérale qui fait glisser ce distributeur (138) par rapport à une surface du dispositif de buse (108) ;
- la douille (130, 130') se déplaçant avec le distributeur (138) lorsque ce distributeur (138) se dilate, du fait que la douille (130, 130') est positionnée à l'intérieur du distributeur (138) et que le dispositif de buse (108) reste essentiellement fixe lorsque le distributeur (138)

glisse par rapport à la surface du dispositif de buse.

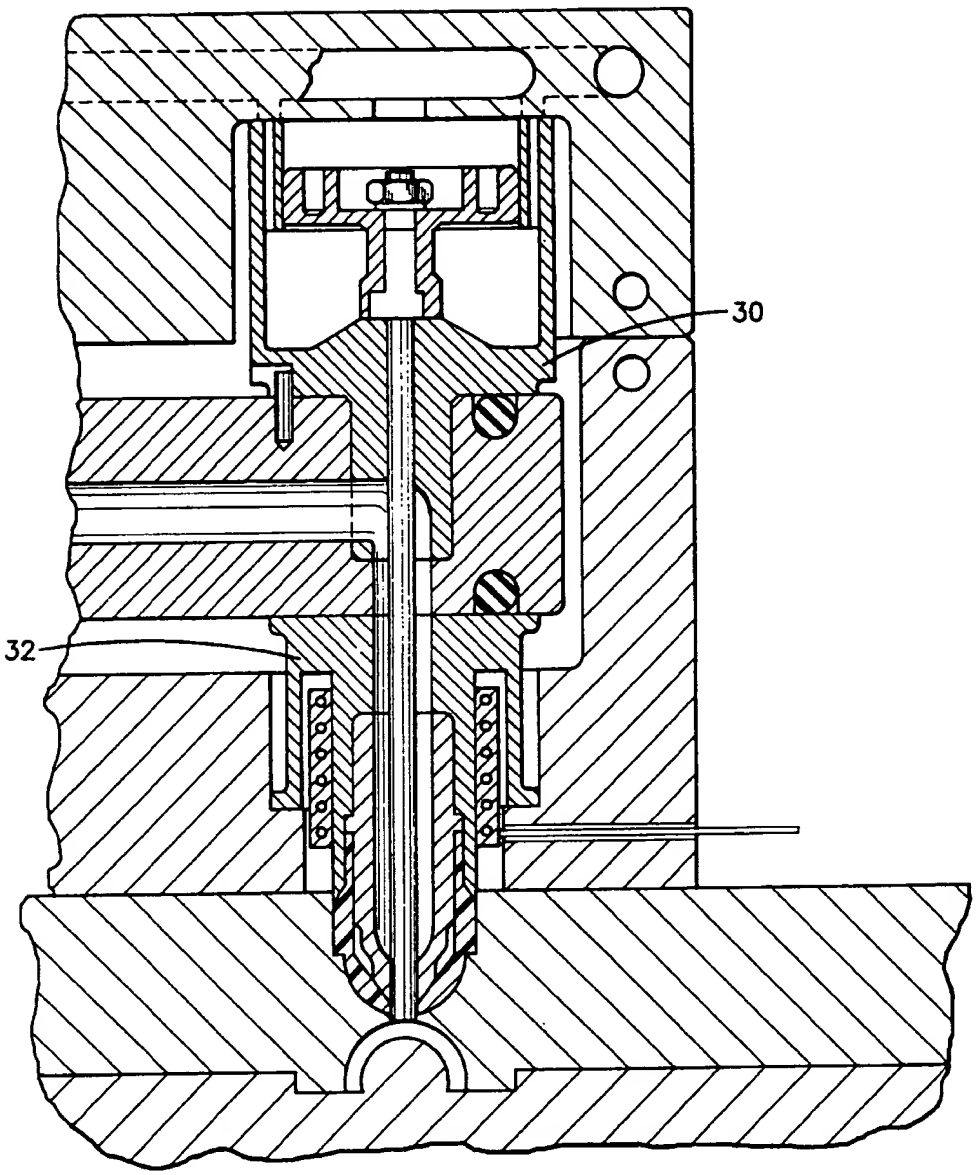
8. Appareil selon la revendication 6 ou 7,
comprenant en outre :

- le dispositif de buse (108) comportant un canal axial (120) à travers lequel s'écoule la matière plastique ;
- une tige de soupape (126) pour ouvrir et fermer le canal axial (120) ; et
- la tige de soupape (126) s'étendant à travers le second canal (144) de la douille (130) et à travers un passage (129) dans la douille (130) qui s'adapte au second canal de matière plastique en fusion (144) dans la douille (130), l'extrémité de la tige de soupap (126) pposé à l' rifice

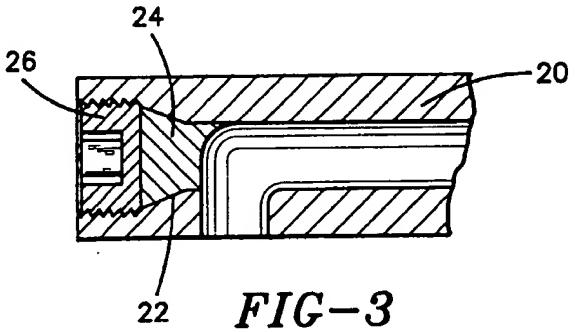
de sortie (128) étant reliée à une tête de piston (131) de façon que le boîtier forme un boîtier de piston pneumatique (136).

9. Appareil selon l'une au moins des revendications 1-8, comprenant :

- un distributeur (138) muni d'un canal de matière plastique en fusion (142) en communication avec une source de matière plastique ;
- une douille (130) munie d'un canal de matière plastique en fusion (144) destiné à s'adapter au canal de matière plastique en fusion (142) du distributeur (138), la douille (130, 130') étant positionnée à l'intérieur d'un alésage (143) du distributeur (138) ;
- un dispositif de buse (108) pour injecter de la matière plastique dans le moule, le dispositif de buse (108) comportant un canal axial (120) en communication avec le canal de matière plastique en fusion (144) dans la douille (130, 130') ;
- le distributeur (138) étant soumis à une dilatation latérale qui fait glisser ce distributeur (138) par rapport à une surface du dispositif de buse (108) ;
- la douille (130, 130') se déplaçant avec le distributeur (138) lorsque ce distributeur (138) se dilate ; et
- le dispositif de buse (108) restant essentiellement fixe dès que le distributeur glisse par rapport à la surface du dispositif de buse.



FIG–1
(PRIOR ART)



FIG–3
(PRIOR ART)

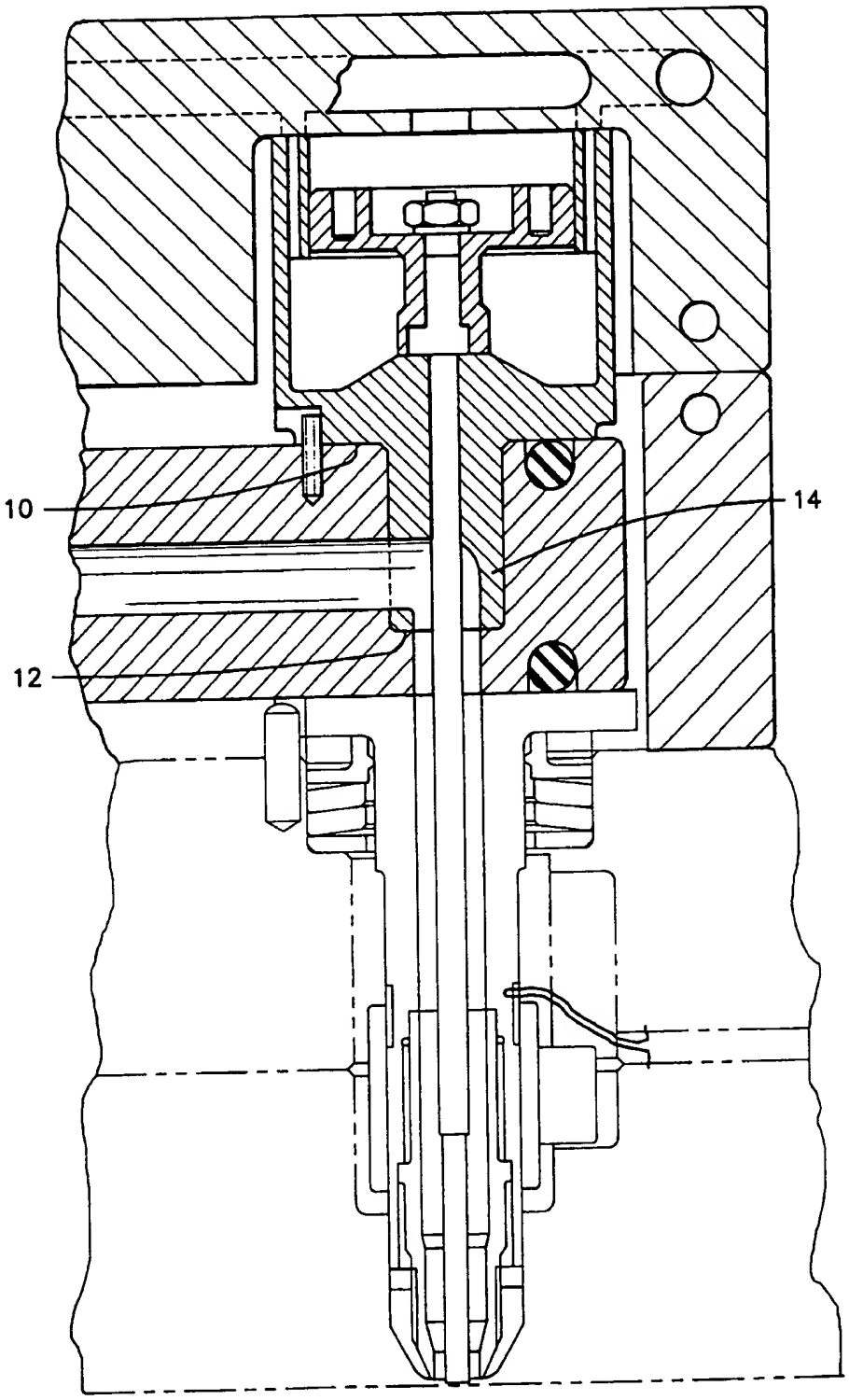
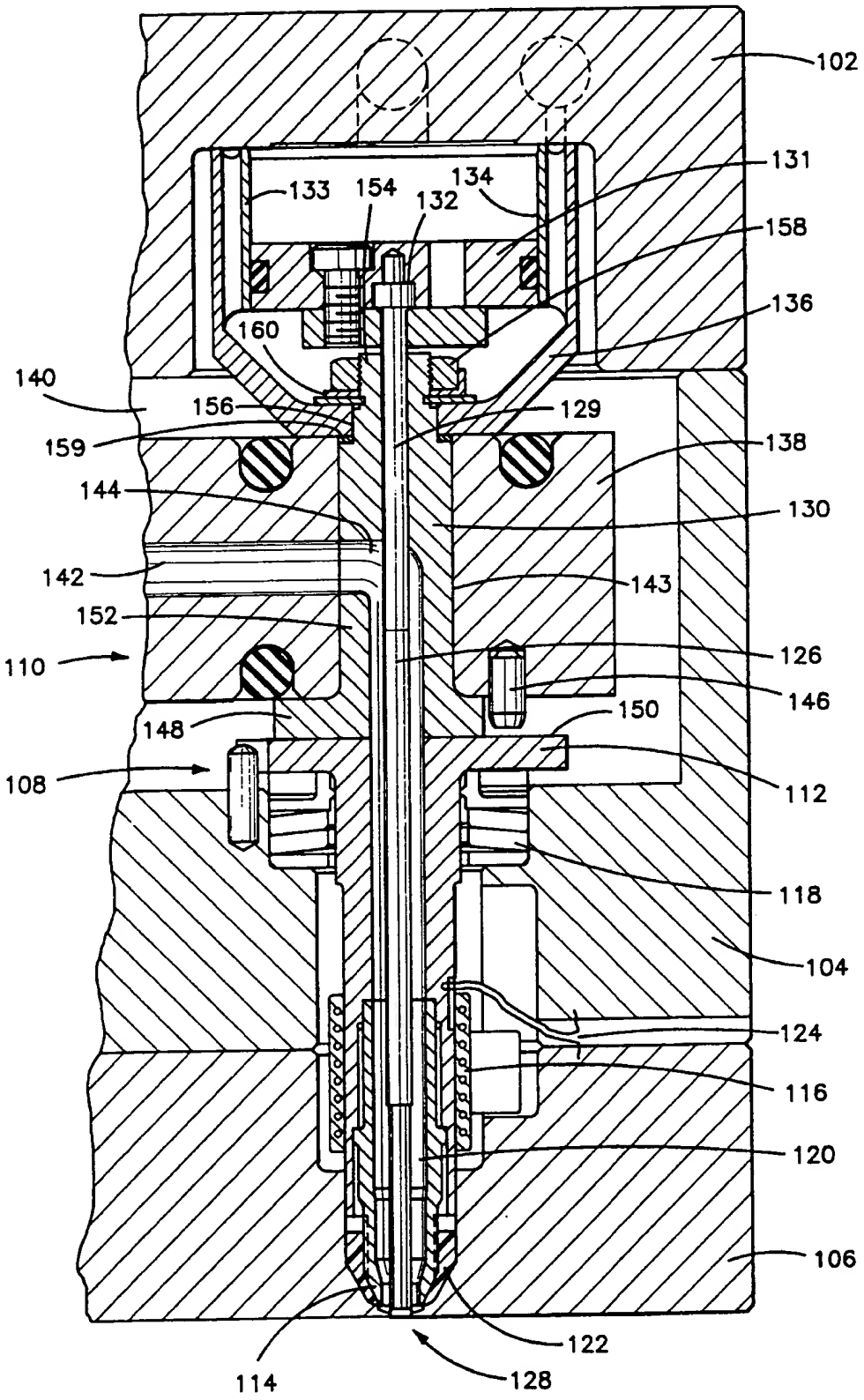


FIG-2
(PRIOR ART)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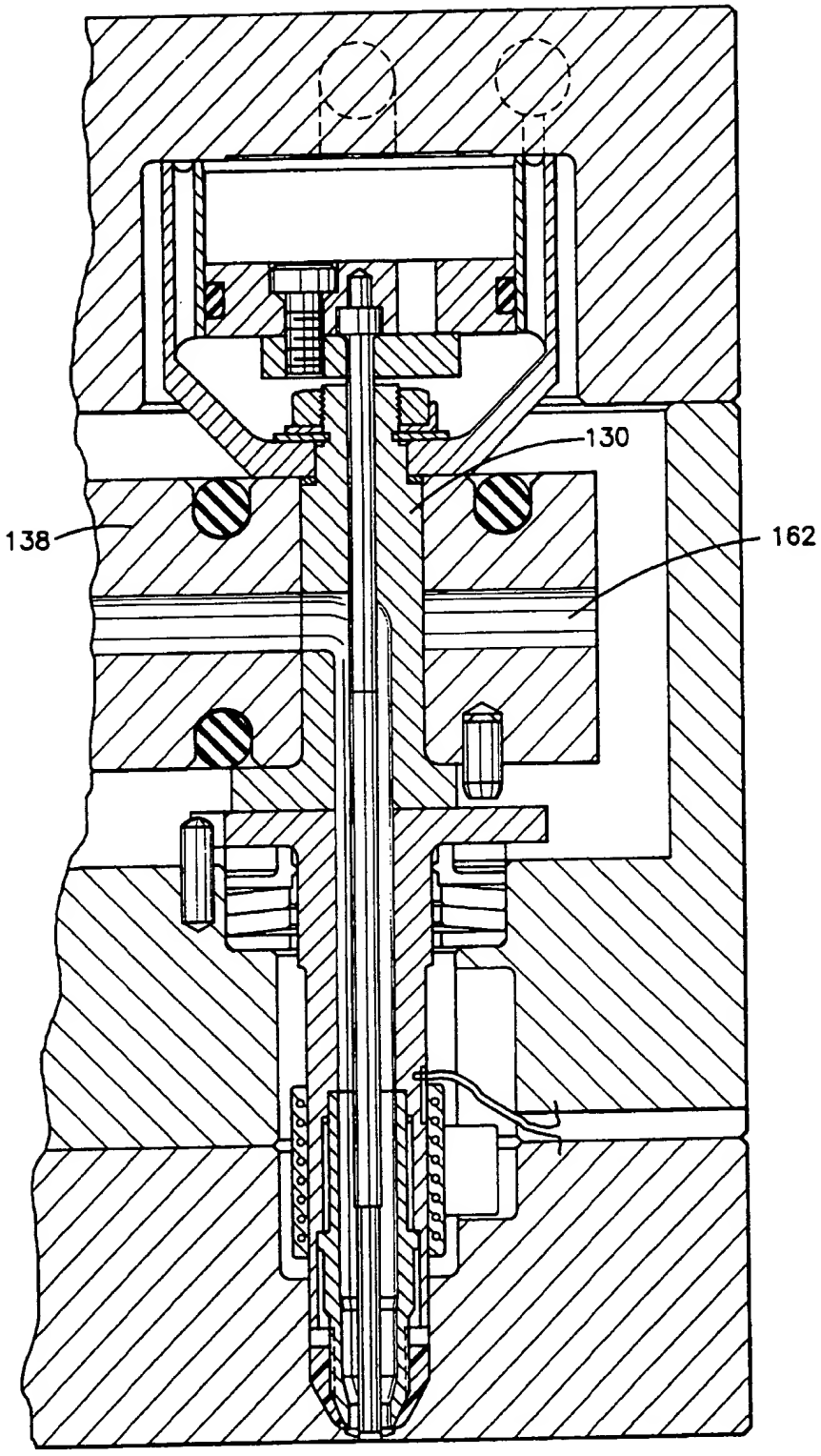
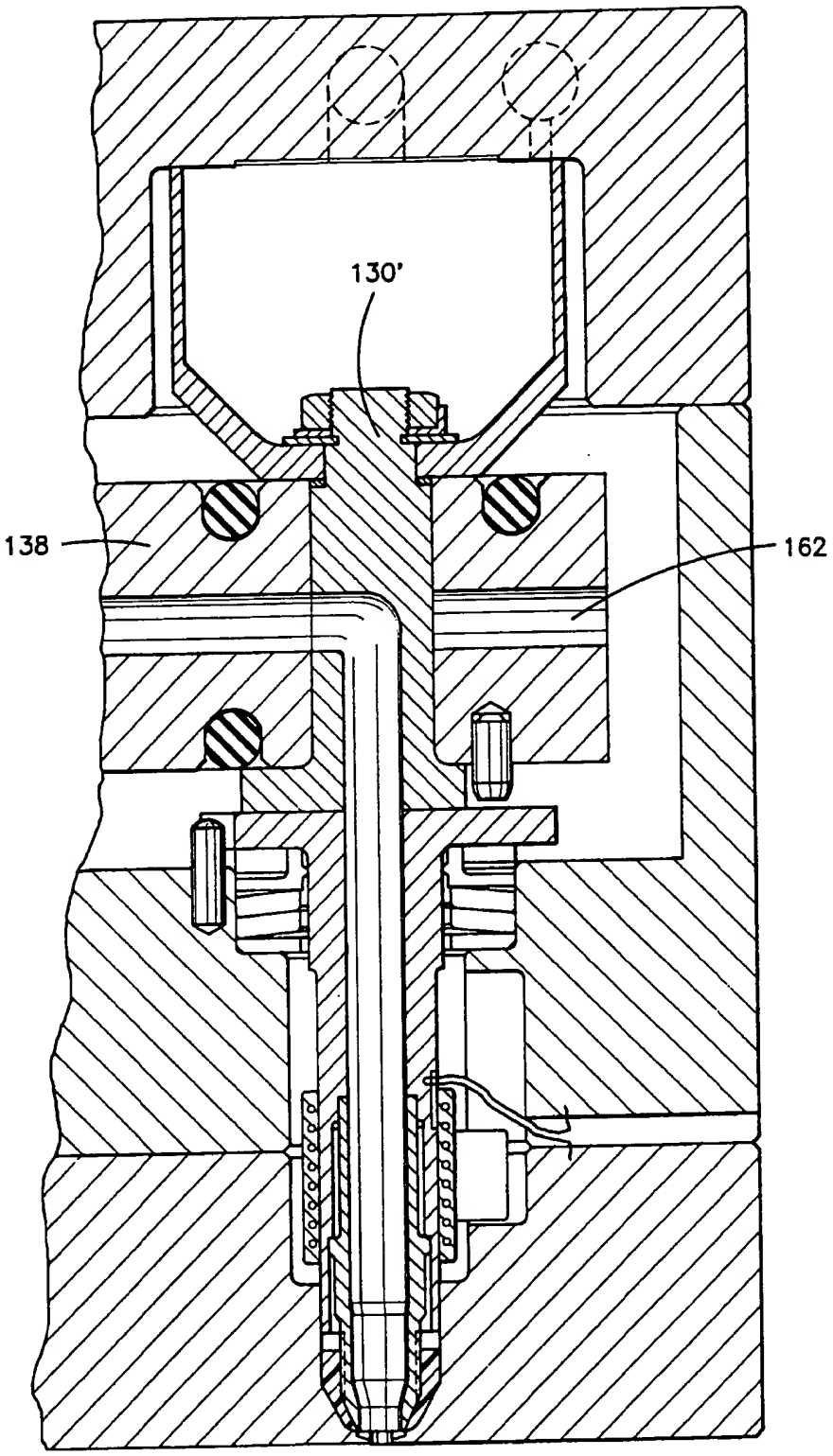
FIG–4



FIG–5



FIG–6